

NORTH CANAL DAM AND DIVERSION CANALS  
(Steidl and Tweet Dam and Diversion Canals)  
Deschutes River near North Division St.  
Bend ~~vicinity~~  
Deschutes County  
Oregon

HAER No. OR-61

HAER  
ORE  
9-BEND,  
2-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
Columbia Cascades Support Office  
National Park Service  
909 First Avenue  
Seattle, Washington 98104-1060

# HISTORIC AMERICAN ENGINEERING RECORD

## NORTH CANAL DAM AND DIVERSION CANALS (Steidl and Tweet Dam and Diversion Canals)

HAER No. OR-61

HAER  
ORE  
9-BEND  
2-

**Location:** Deschutes River, near North Division Street  
Bend  
Deschutes County  
Oregon

USGS Bend Quadrangle, Universal Transvers Mercator  
Coordinates:  
Dam - 10.635683.4881487  
Canals - 10.636000.4881732

**Date of Construction:** c. 1910-1946

**Engineer:** John Dubris, Civil Engineer; Levi D. Wiest, Irrigation Engineer

**Builders:** North Canal Company  
The Deschutes Irrigation and Power Company  
Central Oregon Irrigation Company  
North Unit Irrigation District  
Deschutes Reclamation and Irrigation Company

**Present Owners:** Central Oregon Irrigation District  
North Unit Irrigation District  
Deschutes Reclamation and Irrigation District

**Present Use:** Irrigation Facilities

**Significance:** The North Canal Dam and diversion canals constitute one of the most historically significant irrigation engineering complexes in Central Oregon. The complex is associated with important developments in agriculture as well as with locally prominent investors and pioneer irrigation companies in the Bend area. The North Canal Dam (1912) is the largest dam on the Deschutes River in the Bend area and is the oldest dam built for irrigation. When constructed, the 33-foot high, 200-foot wide concrete arch dam was a significant engineering feat. The canal was the primary influence in the founding of Redmond and also contributed to the growth and stability of other communities in the area. The Deschutes Reclamation and Irrigation Co. Canal (c. 1910) is

associated with one of the earliest filings for Deschutes River irrigation water rights claimed by ranchers George W. and C.B. Swalley. The construction of the canal involved considerable engineering and building skills, including features that were "hand-built" by local ranchers. The North Unit Main Canal (c. 1940) brought the first irrigation waters to Jefferson County, Oregon. The canal is significant for ensuring the growth and development of the cities of Madras and Culver and the vicinity of Agency Plains.

**Report Prepared By:** Oregon Department of Transportation

**Date:** May 27, 1998

## I. DESCRIPTION

The North Canal Dam and associated irrigation elements are located within the city limits of the City of Bend, approximately bisecting the center of the community on the north side of town. The boundaries of the complex include some 60-acres roughly bounded by the west bank of the Deschutes River, a line running 300 feet north and parallel to Butler Market Road, the Burlington Northern Railroad tracks, and Yale Avenue (Fig. 2).

The principal components of the complex are the dam, its diversion system, and three canals, with particular focus on approximately 1,000 feet of the open conduit North and North Unit Main canals. The third canal, the Deschutes Reclamation and Irrigation Co. (D.R.I. Co.) Canal, is channeled in a pipe and is not a major feature of the diversion dam resource.

Contributing features of the complex include the concrete arch dam, spillway, canal outlets and gates, operating machinery, machinery control house, debris fences/wires, mechanical rotary wheel cleaner, water meters and measuring devices, walkways, canals, maintenance roads, pipes, flumes, and other irrigation-related features.

Non-contributing elements in the complex are city and state-owned rights of way for city streets, state highways and structures. Contained but also excluded from consideration is a small reinforced concrete slab span across the North Unit Main Canal, constructed by the State Highway Department in 1940-41 on North Division Street. Additional non-contributing features are all residential, commercial, industrial, and utility land uses on private property. A small overlook recreational facility, Riverview-Lions Park, is also a non-contributing element. The space currently accommodates a parking lot and a fishing ramp and is jointly managed by Bend Metro Park and Recreation District and Mt. Bachelor Lions.

The North Canal Dam (1912) is a 200-foot wide, 33-foot high concrete arch dam. The installation is one of four extant dams across the Deschutes River in Bend. It is the oldest built for irrigation purposes and the largest of Bend's four dams. Modifications were made to the structure in the late 1930s or early 1940s to accommodate the North Unit Main canal.

The D.R.I. Co. Canal (c. 1910), near the intersection of 3<sup>rd</sup> and Division streets, is the westernmost diversion of the North Canal Dam on the Deschutes River. From the dam, water for the D.R.I. Co. Canal flows through a pipe (approximately three feet in diameter) for some distance before becoming an open ditch. It courses in a north-northeasterly direction for some 10 miles, supplying water to north Bend and the Bend-Redmond area. The present canal operator is the privately owned Swalley Irrigation District, whose 750 subscribers irrigate 4,580 acres.

The middle diversion canal is the North Canal (1912), constructed concurrently with the North Canal Dam. The canal varies in width from 15 to 25 feet and is approximately 10 feet deep. It runs through an open channel that has been cut into the ground or blasted through basalt outcroppings (unlike some of the other Bend canals that are at ground level or slightly below

ground level with earth filled walls or levees). East of the Hampton Inn, at the intersection of Butler Market Road and U.S. 97, is a long section of the canal in a wooden, uncovered flume. From the dam the waterway flows through the proposed Bend Parkway corridor in a northeasterly direction to provide irrigation water to areas north and east of Bend.

The building of the North Unit Main, c. 1940, necessitated modification of the North Canal Dam to enable it to operate as the most easterly diversion. The North Unit Main leaves the dam at a point directly east of the North Canal. For several hundred feet from the outlet on the dam through the Division Street structure, the canal flows uncovered through a concrete liner. It then continues in an unlined ditch similar in dimensions to the North Canal. Both constructions chart nearly parallel courses through the city. The North Unit Main flows to the Madras area in Jefferson County.

The overall integrity of the complex appears to be good, although the companies have undoubtedly modernized equipment and made adjustments over the years to increase the efficiency of the dam and canals. A detailed inventory of changes has not been made. Modifications to the dam and the resulting North Unit Main Canal occurred in the late 1930s or early 1940s, placing these changes within the historic period of the dam complex.

The entire length of the three diversion canals has not been examined. The appearance of the canals at the dam may differ away from the dam site, being wider, shallower, and in the case of the D.R.I. Co. canal, uncovered and unlined.

## II. HISTORIC CONTEXT

### Reclamation Legislation

The first federal irrigation legislation applied to Oregon was the Desert Land Act of 1877, which fostered the concept of private investment in irrigation. The act enabled settlers to purchase 640-acres of desert land at \$1.25 an acre, provided the holdings were irrigated within three years. Abused by absentee owners, those who falsified their identities and consolidated several holdings, and by vague or non-existent compliance, the law was amended in 1890 and expanded in 1891. The new legislation more effectively promoted private investment through irrigation company grants for rights of way through public lands.

A further incentive was the Carey Act of 1894, which gave Oregon a million acres of desert land, with grants to individuals of 160 acres. The Carey Act represented a transition from total reliance on private irrigation development in the 19th century to 20th-century practice in which the federal government took almost total responsibility for some irrigation developments. Under the Carey Act, western states were encouraged to organize large-scale irrigation projects by finding private entrepreneurs to build the necessary dams and canals, and selling land to settlers who would in turn buy water from the private developers.

Responding to political pressure to expand irrigation, the Reclamation Act of 1902 enabled the federal government to participate directly in reclamation projects. Under its provisions, federal dams were to be built and financed through the sale of public lands. Simultaneously, the Reclamation Service was established to administer the program.

Until March 1907, all irrigation projects operated under the Reclamation Service of the Geological Service, U.S. Department of the Interior, which became a separate agency and oversaw projects until 1923. In the early 1930s the U.S. Bureau of Reclamation was created as a separate department.

### **Reclamation in Oregon**

According to Corning's Dictionary of Oregon History (2nd ed.1989), small scale irrigation in Oregon began in 1852 when Jacob Wayner and a man named Thornton constructed what was probably the first irrigation ditch on the Rogue River near the present-day community of Talent. In 1857-58, the Courtney brothers dug irrigation ditches across the Umatilla Meadows near Hermiston in the north central part of the state. In the same decade a narrow 15-mile diversion ditch carried the waters of Mill Creek, near The Dalles, to the agricultural lands of Wasco County. Early Baker County residents recall that ditches such as the Eldorado Ditch, dug for placer mining in the area during the 1870s, were continued in use as irrigation ditches after the gold was mined and agricultural pursuits were begun. Investors found western irrigation incentives attractive, although sufficient capital could not be gathered to fund such projects (Quivik and Hess 1989).

One of the state's earliest cooperative irrigation projects was instigated around the turn of the century to serve fruit growers in Hood River. In 1902, by authority of the Federal Reclamation Act of that year, the Umatilla project was established. This irrigation system was built from 1904-1908, and included an area of 17,000 acres lying along the south bank of the Columbia River, east of the Umatilla River. Water for irrigation of 10,000 acres was diverted from the Umatilla near Echo, and stored in the Cold Springs Reservoir, 24.5 miles to the north.

The Federal Reclamation Act also authorized the Klamath irrigation project, with work beginning in 1903, to serve portions of the Klamath Basin. In 1904 the Deschutes Irrigation and Power Company, through the Pilot Butte Canal, brought water to the evolving city of Bend in central Oregon. Similar projects were undertaken in the Hermiston (1921), Owyhee (1926), Burnt River Valley (1938), Stanfield (1933-1935), and Vale (1926) areas, together with a larger Owyhee project and dam (1938) (Corning 1989). Although 1914 records noted a total of 1,000,000 acres included in irrigation projects, a 1930 survey indicated 898,713 acres actually irrigated in cooperative, private, and Federal and local irrigation districts.

### **Irrigation Development in the Bend Area**

Early Oregon settlers were not initially attracted to the Deschutes Basin, choosing instead land west of the Cascade Mountains where rainfall was more plentiful. The Basin's open range was

grazed by local stockmen who began settling in the area around 1870, and by established ranchers from the Willamette Valley who used the Deschutes area for summer range. Some of those early settlers also engaged in small-scale irrigation efforts. In the 1880s, transcontinental railroads brought sheepmen and a few farmers who competed with cattlemen for use of the land. Stands of timber along the eastern slope of the Cascades also attracted loggers and several sawmill operators. Yet, by the turn of the 20th century the Deschutes Basin was still largely undeveloped for uses other than grazing stock (Quivik and Hess 1989).

The availability of irrigation and the prospect of transforming land into agricultural use played a significant role in the early development of Bend and surrounding communities. The formation of irrigation districts, the damming of the Deschutes River, and the building of canals were events which shaped and continue to affect central Oregon. These endeavors occurred within the river basin in an area approximately 75 miles long and 30 miles wide. Here, mean annual precipitation of the area is approximately 12 inches, falling primarily as snow in the winter months. Thus the lack of rainfall, together with a short growing season, necessitated irrigation for successful ranching in the area.

Prior to intensive reclamation efforts, irrigation was practiced on a very small scale in the present Bend area. Diverted through ditches that did not reach far from riparian banks, the water was used to irrigate gardens for the few ranches that bordered the river, and to cultivate small tracts of alfalfa.

The earliest filing on record for Deschutes River water rights was made by the Cline Falls Power Company in January 1892, although the project was intended to provide hydroelectric energy rather than irrigation water. Probably the first diversion of Deschutes water for irrigation purposes in the Bend area occurred before 1893 on the "Dutch John" Felderworst homestead. After locating on the east bank of the Deschutes just upstream from the site where central Bend was to evolve and where the Brooks-Scanlon lumber mill began operation in 1915, Felderworst is believed to have been the first farmer to irrigate in the immediate vicinity of the present townsite. On his place about a mile upriver, he cleared a bit of bottomland, built the canal locals called the "Dutch John" ditch, and grew alfalfa for several seasons.

Private irrigation was also practiced on a small scale on the W.H. Staats property. Water was taken from the Deschutes through use of a bucket mill which dumped the water into small ditches for Mrs. Staats's carefully cultivated garden. Produce from the garden supplied fresh vegetables to stockmen on their way to and from mountain ranges in the late spring and early fall. The Staats's bucket irrigation system is thought to have irrigated 10 or 12 acres. Nearby, on the same side of the river, John Siscmore had a small ditch on his Farewell Bend Ranch (Bend Bulletin 1953).

In 1893 corporate irrigation was introduced by the Three Sisters Irrigation Ditch Company. The company designed a canal system to distribute and sell Tumalo Creek water to farmers north of present-day Bend. Two years later, construction began on the Squaw Creek Irrigation Company's canal, and by 1900, other local, private irrigation companies had begun to survey the

area for potential irrigation projects. Charles C. Hutchinson formed the Oregon Development Company in 1898 and filed on Deschutes water that spring. The Deschutes Reclamation and Irrigation Company (commonly called the Swalley), formed by Jim Benham, George W. Swalley, and others, incorporated the same year. In 1902, the Pilot Butte Development Company entered into a contract with the State of Oregon for the reclamation of lands under the terms of the Carey Act. The Arnold Irrigation Company incorporated two years later, and the North Irrigation Company was founded in 1908.

The first intensive effort to divert Deschutes River water occurred when Bend founder Alexander M. Drake arrived in central Oregon in 1900. Drake purchased land, built a lodge and began the task of creating the town of Bend, which he platted in 1904 and officially incorporated in January 1905. After Drake erected his summer lodge in 1900 on the eastern bank of the Deschutes, downstream from the Staats and Sisemore properties, he constructed three pumping plants: one at the Staats's, one just below the present Tumalo Avenue bridge, and one a short way downstream. Another was constructed to supply water to his lodge. With the availability of water Drake was able to equip his hostelry with a bath, a novelty in central Oregon at the time. The enterprising Drake also founded the Pilot Butte Development Company which competed with Hutchinson's Oregon Irrigation Company for several years until both companies sold to the Deschutes Irrigation and Power Company in 1904 (Clark 1985).

Water from the Deschutes also provided irrigation for "Garden Row," the residential section where Bend's social set lived. These homes, with their fine gardens and occasional lawns, were located on the east side of the river between the present-day Tumalo Avenue and the Drake Park bridges (Bend Bulletin 1953).

More sophisticated irrigation efforts occurred in the Bend area from 1904 to the mid-1910s. In July 1904 the Deschutes Irrigation and Power Company began a large-scale construction project, building flumes and canals north and east. From the diversion point on the Deschutes, two main canals were constructed. The Central Oregon Canal (later the Central Oregon Irrigation Canal) ran northeast toward the west side of Powell Butte while the Pilot Butte Canal pointed north toward Redmond. The Deschutes Irrigation and Power Company formed in 1904 evolved into the Central Oregon Irrigation Company in 1910. The Arnold Irrigation Company eventually absorbed the North Irrigation Company and others. By the 1930s other companies in the Deschutes Basin had also reorganized as irrigation districts.

Although work had begun years before, the next major irrigation project, the North Unit Main or Deschutes Project, would not be dedicated until 1946. The major canal, spanning 65 miles, originated in Bend and reached into Jefferson County. The project provided a vital link for Deschutes water diverted into six irrigation systems: the Swalley, Central Oregon Irrigation District, North Unit, Lone Pine, Arnold and Tumalo.

#### **Canal Construction Technology**

Historical records indicate early Deschutes Irrigation and Power Company canals were built by hand and horse labor. Much of the excavation was done with horse-drawn scrapers. In areas of rock (typically early Pleistocene lava flows), steel miners' drills were combined with sledgehammers to drill holes for blasting charges. After fuses - and later, detonators - set off the blast, crews of men removed the loosened rock and shoveled and scraped the canal to grade and depth (Clark, Lecture Notes n.d.). In November 1904, the Deschutes Irrigation and Power Company improved construction methods by purchasing two portable steam boilers. One boiler had twenty horsepower, the other six. Both were intended to furnish power for operating rock drills. Together they could bore 400 feet a day in lava rock, where previously a three-man rock crew required a whole day to bore 18 or 20 feet. Some 50 Italian laborers who brought the company's work force to 200 men and 100 teams (Vaughan 1981) also aided construction.

Early irrigation in Central Oregon was generally facilitated by gravity systems, as opposed to the less common pumping irrigation systems. Gravity systems derived their water supply from diversion of a river, or stream, conveying it in a system of canals, or channels, to the area to be irrigated. The diversion raised the water level to force the desired flow through a headgate into the canal opening. This was usually accomplished by a diversion dam, or weir, across the watercourse.

The character and cost of construction was determined by the topography. Hillsides too steep for open canal excavation required fluming supported on benches cut in the hillside, or a rectangular concrete section made with a retaining wall on the downhill side. Flumes, as well as siphons, also helped bridge depressions, while tunnels were bored through ridges. The main canal was constructed on a prominent ridge, or along the higher level of the land to be irrigated. Lateral canals headed at the main canal and ran along commanding situations, usually down ridges formed by topographical irregularities, to supply the sub-laterals and ditches, or distributaries, which delivered the water to each ranch (Hall 1994).

### **Deschutes River Dams in Bend**

Four dams were constructed on the Deschutes River in the city of Bend (Fig. 1). Two dams were built for irrigation/water storage and diversion, while two were erected for power and log storage uses. The oldest extant Deschutes River dam in Bend was located north of Newport Avenue and was constructed in 1910 (Henshaw *et al* 1914; Vaughan 1981). When completed the installation created Mirror Pond. The dam's sponsor, Bend Water, Light and Power Dam, supplied wattage for Bend's first electric lights in November of that year. Reports of construction costs varied from \$40,000 (Vaughan 1981) to \$100,000 (Henshaw *et al* 1914), depending on the source of information. The dam was acquired by the Central Oregon Power Company in 1911 and later by Pacific Power and Light Company. The date of construction of the dam and powerhouse is also unclear. The Statewide Inventory of Historic Resources records the date as 1913, as does a photo in Hatton's Bend in Central Oregon (1978). However, it is more likely the dam was built in 1910, with subsequent powerhouse construction and other changes made in 1913. This resource is also noted in the Bend Comprehensive Plan Inventory.

The North Canal Dam, or Steidl and Tweet Dam, was the second installation, built c. 1912. It was the first dam built for irrigation while being the largest of the city's dams.

The third dam was erected around 1916 at the "bend in the river," south of Colorado Avenue. It was constructed to facilitate a logging millpond for the Shevlin-Hixon and Brooks-Scanlon mills that opened the same year. This low dam was built under a wooden bridge. Local literature provides few clues about the facility.

The fourth dam was also built for storage and diversion of irrigation water. According to a history of the Tumalo Irrigation District (Deschutes County Historical Society 1985) the small facility was built in 1922 and extensively rehabilitated in 1973. It is located near Pioneer Park and the Riverside Motel, north of the Portland Avenue Bridge. The system diverts and carries water overland 4.8 miles from the Deschutes River to a point just north across Tumalo Creek from Tumalo Feed Canal.

### III. HISTORY OF THE NORTH CANAL DIVERSION DAM COMPLEX

The North Canal Dam on the Deschutes River has a rich, if historically confusing, background. It is, however, a focal point for early irrigation of lands in the Bend area. From its impoundment it pours irrigation water into three canal systems during the summer season, leaving little of the Deschutes River downstream. Bend historian Raymond Hatton (1978) observed, "This diversion of the Deschutes leaves ... only a very weak ghost of a river to trickle past the Riverhouse Restaurant and Motel."

The North Canal Dam, 1912, is the oldest surviving dam built to capture, store, and divert water for irrigation, and the largest of the city's four dam installations. The dam, promoted by the Central Oregon Irrigation Company though built by the North Canal Company, may be a second dam at this location, likely following a small power generation dam built by John Steidl and Thomas Tweet. The dam complex site thus has two distinct areas of historic interest: first, power production, and later, irrigation.

Pioneer lumbermen John Steidl and Thomas Tweet were prominent in the early development of Bend. John Steidl came to the area in 1902 from Bemidji, Minnesota, where he worked for the Shevlin-Hixon Company. He was sent to Central Oregon to cruise timber before the company built its mill in Bend. Steidl purchased land north of the future Bend townsite and built a house. In partnership with Henry Reed he erected a small sawmill (Steidl and Reed Sawmill) in 1903 on the west bank of the Deschutes across from present Pioneer Park. Until it burned in 1908, the mill functioned as the community's major lumber manufacturing plant, harvesting timber from the convenient slopes of Awbrey Butte. Steidl was also instrumental in influencing officials of the Shevlin-Hixon Company to locate their big pine sawmill in Bend in 1915 (Vaughan 1981).

Another of John Steidl's involvements was that of principal in the organization of the Deschutes Irrigation and Power Company in 1904. Steidl, along with F. S. Stanley, E. A. Baldwin, E. Guerin, and J. E. Sawhill had purchased the Pilot Butte Development Company and the Bend Townsite Company from A. M. Drake (Tonsfeldt 1983). The Central Oregon Irrigation Company, the probable builder of the North Canal Dam and North Canal succeeded the Deschutes Irrigation and Power Company in 1910. Steidl Road, on the west side of the Deschutes River across from Pioneer Park, commemorates the mill founder and influential promoter of irrigation.

Thomas Tweet was an immigrant from Bergen, Norway. He joined the Union Army in 1861, was attached to the famous Seventh Wisconsin Iron Brigade Infantry, and served until the end of the Civil War. In 1902, Tweet and his wife Bella came to the Bend area. They built a house on the east bank of the Deschutes River near present Xerxes Avenue and also purchased land on both sides of the Deschutes River near present Underwood Avenue. Tweet Place, parallel to Division Street in north Bend, honors Tweet's contributions to the area.

In Central Oregon, Tweet and John Steidl cruised timber, securing information for incoming settlers and other interests. The two men decided to move their steam-powered sawmill to Central Oregon from Minnesota, but Steidl went into partnership with Henry Reed (Deschutes County Historical Society 1985). In 1905 Steidl and Tweet filed with the State of Oregon for use of Deschutes River water for 150 kilowatts of power and an ice plant (Federal Power Commission 1922). This small power plant may have been planned for uses in the Lytle and Weistoria areas.

According to a report in 1914 by the U.S. Geological Survey (Henshaw et al):

Water rights at Bend are somewhat complicated by the recent construction of a 14-foot dam across the Deschutes River for the development of power. This dam serves also to maintain a pond for the storing of logs in connection of a sawmill.

The above information confuses the historical record because North Canal Dam is more than twice the height indicated by this report. Other resources detail how North Canal Irrigation Dam, promoted by the Central Oregon Irrigation Company, was built in 1912 at a cost of over \$200,000. This sum included excavation and construction of the canal for about 1.4 miles to its intersection with the Pilot Butte Canal (Deschutes County Historical Society 1985). The new dam was substantially higher, rising either 35 feet (Gribskov 1980) or 28 feet (Tonsfeldt 1983). (Correspondence with the current owner, the Central Oregon Irrigation District, indicates the dam is 33-feet high.) The dam was built by the North Canal Company, but information about the company is lacking in the historic literature. The enterprise may have been a special endeavor created specifically for the financing and construction of the dam and the North Canal by the Central Oregon Irrigation Company and other interested parties including those proposing

a North Unit Canal. (The North Unit Main Canal, however, would not be completed for three decades.)

One source (Deschutes County Historical Society 1985) indicates that John Dubris engineered the building of the North Canal and may also have designed the dam. Dubris was born in Austria in 1885 and emigrated at the age of three. A graduate of Cornell University, he was a civil engineer who arrived in Bend in 1909 after working for the Oregon State Engineer's office. Later, in 1915-16, Dubris built the Tumalo Irrigation District with civil engineer Robert G. Gould.

The reinforced concrete arch dam is an early example of the type. Although arch dams were extant in Roman times and later in Persia and Spain, it was not until the mid-19th century that French engineer Emile Zola developed a simple mathematical formula for analyzing basic stresses in arch dams. The first major American arch dam was a 64-foot high design built in the 1880s in Bear Valley in southern California. This structure inspired other engineers to innovate stability. Some early arch dams were constructed of masonry, but by the early 20th century concrete came into almost universal use (Jackson 1988).

The Steidl family retained some of their interests in the new dam, for in 1912 the Deschutes Reclamation and Irrigation Company (Swalley Canal) paid the family \$250 for a perpetual easement 85 feet by 30 feet for the intake pipe at the dam. According to the Statewide Inventory form (Tonsfeldt 1983), John Steidl and Thomas Tweet planned to install generating equipment at the diversion. Immediately after the dam was finished, problems arose related to water rights and power generation. Subsequent litigation and a city power franchise election determined the fate of the dam. In 1921 the litigation resulted in a decision by Judge Deitrich which awarded the distribution system of the North Canal Company to Central Oregon Irrigation. By 1934, the conflict over generating power at the site had apparently been resolved by default.

The locating of the dam north of downtown Bend had a significant impact on the growth and development of the city. The initial diversion of Deschutes River water for irrigation in 1904 was south of where the City of Bend would be incorporated the following year. As the town grew downstream, so did industrial development and power needs. Before long it was apparent that continuance of such a heavy diversion for irrigation upriver from Bend would not leave enough water in the river for industrial purposes as it flowed through Bend. Water taken out below the city could first be allocated for industrial purposes and then for irrigation. As a result, the North Canal Dam was constructed on the north edge of the city (Deschutes County Historical Society 1985).

Three irrigation canals carry water diverted from the dam. The Deschutes Irrigation and Reclamation Company Canal (Swalley Canal) was constructed c.1910 with water flowing from a pipe at the dam beginning in 1912. The North Canal, at 1.4 miles long, was built in conjunction with the dam in 1910-1912. It connected to the Pilot Butte Canal to irrigate the Redmond area. (The Pilot Butte Canal is often referred to as the North/Pilot Butte Canal since the two were

consolidated under the Central Oregon Irrigation District.) According to the Federal Power Commission's Deschutes River study (1922), in 1914-1915 the D.R.I. Co. Canal diverted 33,000-acre feet while the North Canal diverted 107,000-acre feet. These diversions accounted for about 10 and 37 percent, respectively, of the total flow diverted from the Deschutes at the time.

The third canal, which was a later development, is also associated with major irrigation efforts in Central Oregon. This installation, the North Unit Main Canal, was built in the early 1940s and required modification to the dam on the east side. The waters from the North Unit Main Canal flow some 65 miles north to the Madras, Culver, and Agency Plains area of Jefferson County where more than 50,000 acres have been reclaimed (Bend Bulletin 1953). Officially the project was called the North Unit of the Deschutes Project. This designation dates to an early north-south division of the Deschutes River Basin at the Crooked River Canyon. The project's name was also frequently abbreviated to simply the "Deschutes Project" or the "Big Ditch."

As early as 1904, the settlers began public meetings to discuss the potential of the project that became the North Unit Main Canal. A feasibility study was conducted in 1905 and a 1909 report was issued, the Central Oregon Investigations of Irrigation Possibilities, with Joseph Jacobs as consulting engineer (Banks 1946). On March 20, 1916 the North Unit Irrigation District was organized; it covered an area of 133,000 acres. Bonds were voted but when the bond issue was contested, the undertaking became dormant. A court decision in 1919 favored the project, enabling the U.S. Bureau of Reclamation to begin investigation in 1922 for a water supply source. The project stalled until further exploration was done in 1937 and it was proven feasible for construction in November 1937.

Work commenced in 1938 when the Civilian Conservation Corps (CCC) initiated construction of the water storage dam and distribution system at the Wickiup Dam site about 45 miles upstream from Bend. This unit of the CCC, the largest in the West, was formed from one camp of 600 men alternately stationed near Redmond, and at Wickiup, or divided between the two camps. The CCC worked on the project for three years but construction was again delayed at the beginning of World War II. In 1943 and 1944 work resumed when the government assigned Mennonite and conscientious objectors to the North Unit project. These laborers were engaged in dam construction, reservoir clearing and canal excavation.

During this period reduced Bureau personnel worked on excavating the big cut in the main canal. The North Unit Main was designed to cross the Crooked River Gorge at a height of 160 feet above the river level and to span the 521-foot distance from rim to rim. A concrete bridge (flume) carried the canal. Two tunnels were bored through Smith Rocks. Tunnel No. 1 was 3,440 feet in length, while No. 2 was 3,361 feet in length. Sherwood Canyon siphon, a reinforced concrete tube 12 feet in diameter and some 400 feet long, was located between the tunnels.

The modifications to the North Canal Dam and construction of the North Unit Main Canal at the dam occurred in the early 1940s. Construction of the canal was accomplished through blasting and the use of air compressors.

On May 18, 1946, some 6,000 Central Oregon citizens and distinguished visitors witnessed the ceremony of the first turning of water from the main canal into a lateral for irrigation of farmlands. Dignitaries present included Governor Earl Snell, Ex-Congressman Walter M. Pierce, and members of the U.S. Bureau of Reclamation (Banks 1946).

Wickiup Dam, the principal storage facility for waters for the North Unit Main Canal system, was not completed until 1949. This resource has been determined eligible for the National Register of Historic Places (Quivik and Hess 1989).

### **Deschutes Reclamation and Irrigation Company Canal Description and History**

The Deschutes Reclamation and Irrigation Company (D.R.I. Co.) Canal is historically significant in the context of Bend area history because of its association with one of the region's early irrigation programs and with prominent Central Oregon pioneers. The canal draws its familiar name from local ranchers George W. and C. B. Swalley, who in 1898 were some of the earliest residents to file for irrigation water rights from the Deschutes River.

The D.R.I. Co. Canal's point of diversion is the North Canal (Steidl and Tweet) Dam on the Deschutes River near the present intersection of Division Street and U.S. Highway 97. From the dam the water flows through a pipe for some distance, then continues as an aboveground open ditch. It flows in a north-northeasterly direction for about 10 miles to irrigate northern Bend and the Bend-Redmond area.

The entire length of the D.R.I. Co. Canal has not been examined. For most of its length it flows uncovered and is similar in appearance to the subject section at Empire Boulevard, N.E. (Fig. 2). This run appears to retain its integrity and is representative of the original canal. The piped sections above and below ground have decreased integrity. No other associated irrigation features are present except the canal in the project sections.

There are three points of contact/intersection of the D.R.I. Co. main canal with the Bend Parkway and its auxiliary street improvements: Empire Boulevard, N.E.; River Mall Avenue, N.E.; and Butler Market Road, N.E. (Fig. 3). The D.R.I. Co. Canal flows northeasterly through a metal arch pipe or culvert under Empire Boulevard, N.E. At this location the open, unlined canal is of rock/earth walled construction and about 12 feet wide, although only a few feet deep. The canal right of way is about 100 feet, the same width as most of the major canals in Bend. The canal exhibits full integrity, but the metal arch culvert under Empire Boulevard appears to be of rather recent construction.

The second point of contact is on River Mall Avenue N.W., between the Bend River Mall and SHOPKO developments. The D.R.I. Co. Canal is in proximity (east) of the Boyd Homestead, another historic resource in Bend. At present, River Mall Avenue is improved to the D.R.I. Co. Canal location. The canal is below ground at this location, but is uncovered northward of the extended north edge of the street. Bisecting Butler Market Road, the canal is below ground.

In the Bend area, ranchers George W. and C.B. Swalley made one of the earliest filings for Deschutes River water rights for irrigation. The brothers filed with the State of Oregon in 1892 for a permit to use water from the Deschutes River. In October 1899, when the Deschutes Reclamation and Irrigation Company was established, it filed with Oregon's Desert Land Board for "5,000 miners inches" of water (Deschutes County Historical Society 1985). The filing was enabled by the Carey Act of 1894, which empowered states to handle the distribution of water for reclamation purposes. As desert lands were homesteaded, irrigation water rights in Oregon were awarded through the State Land Board, later the Desert Land Board.

The irrigation pioneers creating the Deschutes Reclamation and Irrigation Company included the Swalley brothers (George W. and C.B.), W.R. McFarland, B.C. Tom, W.H. Birdsong, James R. Benham (as in Benham Falls), W.H. Gann, and William Johnson. Each of the members was to receive one-eighth of the water. Gann later sold his share to the company, and some time afterward Frank Glass purchased it, making him one of the shareholders. C.M. Elkins of Prineville acquired a half interest in McFarland's share (Shaver et al 1905; Deschutes County Historical Society 1985).

After 1899, ditches, flumes, and roads were built. All of the work was done by ranchers. When they were not working on their property or on the Swalley Ditch, many ranchers helped manufacture lumber at the O.B. Riley Mill. The mill had been built primarily to furnish lumber for the numerous flumes necessary to accommodate the irregular topography. For their work on the Swalley project, laborers received \$2.25 per day. Company finances were in disarray, however, and it was necessary to levy assessments whenever there was a shortfall.

By 1911 progress had been made by the Deschutes Reclamation and Irrigation Company and also by the Central Oregon Irrigation District Company, which was building the North Canal northward to Redmond. The projects overlapped between Bend and Redmond. Where it was easier for the Central Oregon Irrigation District to run water in the Deschutes Reclamation and Irrigation Company ditches, and vice versa, the two organizations agreed to carry each other's water. This cooperative situation continues to the present (Deschutes County Historical Society 1985).

In 1912, the Steidl family received \$250 for a perpetual easement of 85 feet by 30 feet for a Deschutes River water diversion through an intake pipe at their dam. Rights of way for the canal were purchased for \$10 to \$25. Work on the irrigation ditches progressed slowly but steadily. The exact date of construction of the canal in the project area cannot be ascertained.

from the historic literature, but a reasonable date is circa 1910, although water did not flow until after the completion of the North Canal Dam in 1912.

In 1913, the first official ditch rider, George Botts, was hired. Botts received \$55 a month for a three-day week. Fred Wallace, manager of Tumalo Irrigation, designed and helped with the headgates. M.W Rogers was ditch manager for construction.

According to a Federal Power Commission report (1922) the D.R.I. Co. Canal diverted 30,300 acre-feet of water from the Deschutes River in 1913-14, or about 10% of the total diverted at that time. By 1920, the D.R.I. Co. Canal irrigated 3,000 acres, with 5,000 acres of water rights sold. These reclamation efforts were part of some 81,000 acres being irrigated by the Deschutes River and its tributaries (Federal Power Commission 1922).

In 1921, the D.R.I. Company decided to take several laterals as company responsibility. In 1924, a measuring clock was purchased. Two years later, in 1926, the company operated with a profit, assessing ranchers at \$1.00 per acre. According to the Bend Chamber of Commerce (Cramb 1931), the Deschutes Reclamation and Irrigation Company (Swalley) had 6,638 acres of which 3,600 acres were under cultivation. In 1940, the Deschutes Reclamation and Irrigation Company had 147 stockholders using 4,584 acres of water. By 1993 the Swalley assisted 750 subscribers irrigate about 4,580 acres. Although the Swalley canal is operated by the Deschutes Reclamation and Irrigation Company, Bend citizens continue to refer to it as the Swalley, after the Swalley brothers.

#### IV. PROJECT INFORMATION

This documentation was provided by the Research Unit of the Environmental Section of the Oregon Department of Transportation as a result of a proposed highway improvement project being undertaken by the Oregon Department of Transportation. Sections of the historic resource documented in this report are located within the boundaries of the Bend Parkway project and will be impacted in varying degrees by project construction. The Bend Parkway project defines a new route for the Dalles-California Highway (U.S. 97) through the city of Bend, Deschutes County, Oregon. It creates a new alignment for U.S. 97, removing it from its existing course along 3rd Street to one which, except for portions near the north and south ends of the project, closely follows Division Street (Fig. 2, 3). The project area runs 6.9 miles. The new route through Bend eventually will be a 4-lane limited-access facility, including a raised median and shoulder/bike lanes. Some areas of the project include sidewalks and other features such as signalized intersections and interchanges.

#### V. SOURCES

Banks, Maxine. "The Big Ditch," Article for the Redmond Spokesman. Redmond, 1946.

Bend Bulletin. "50th Anniversary Edition", Bend, June 16, 1953.

Brogan, Phil F. East of the Cascades. Binford and Mort, Publishers, Portland, Fourth Edition, 1977.

Clark, Keith. Information on Steidl, Reed and Tweet from the Deschutes County Historical Museum files, Bend, 1990.

\_\_\_\_\_. Redmond: Where the Desert Blooms. Western Imprints, Oregon Historical Society Press, Portland, 1985

Corning, Howard M. Dictionary of Oregon History. Binford and Mort Publishing, Portland, Second Edition, 1989.

Cramb, L.K. The Irrigation Situation in Central Oregon: A Proposal that the Federal Government Provide Storage. Bend Chamber of Commerce, Bend, 1931.

Deschutes County Historical Society. A History of the Deschutes Country in Oregon. Bend, 1985.

Federal Power Commission. Report to the Federal Power Commission on Uses of the Deschutes River, Oregon. Government Printing Office, Washington, DC, 1922.

Fraser Design and Hess, Roise and Company. "Draft Historic American Engineering Record, McKay Dam, HAER No OR-18, Umatilla County, Oregon." U.S. Bureau of Reclamation, Boise, Idaho, June 1990.

Goddard, Linda, and R. Bryant. Cultural Resource Overview: Deschutes National Forest, Oregon. Prepared for Deschutes National Forest by Pro-Lysts, Inc., Eugene, 1979.

Gribskov, Joyce. Pioneer Spirits of Bend. Maverick Publishers, Bend, 1980.

Hall, Michael S. Irrigation Development in Oregon's Upper Deschutes River Basin 1871-1957: A Historic Context Statement. Deschutes County Historical Landmarks Commission. Bend, 1994.

Hatton, Raymond R. Bend in Central Oregon. Binford and Mort, Publishers. Portland, 1978.

Henshaw, F.F., John H. Lewis, and E.J. McCaustland. Water Supply Paper 344: Deschutes River, Oregon and Its Utilization. U.S. Geological Survey, Department of the Interior, Government Printing Office, Washington, D.C., 1914.

Jackson, Donald C. Great American Bridges and Dams. The Preservation Press, National Trust for Historic Preservation, Washington, D.C., 1988.

National Park Service. National Register of Historic Places. U.S. Department of the Interior, Washington, D.C.

Quivik, Fred L. and Jeffrey A. Hess. Determinations of Eligibility for Seven Bureau of Reclamation Dams in the Pacific Northwest Region: Deadwood, Grassy Lake, McKay, Crane Prairie, Wickiup, Owyhee, and Agency Valley Dams. Pacific Northwest Region, Bureau of Reclamation, U.S. Department of the Interior, Boise, Idaho, September 1989.

Quivik, Fredric L. and Amy Slaton. "Draft Historic American Engineering Record, Owyhee Dam, HAER No. OR-17, Malheur County, Oregon." U.S. Bureau of Reclamation, Boise, Idaho, undated.

Sanborn Map Company, Maps of Bend, 1913, 1917, 1920, 1928. New York City.

Shaver, F.A., et al. An Illustrated History of Central Oregon. Western Publishing Company Publishers, Spokane, Washington, 1905.

Speulda, Lou Ann. "Oregon's Agricultural Development: A Historic Context, 1811-1940." State Historic Preservation Office, Salem, 1989, Revised 1990.

State Historic Preservation Office. Statewide Inventory of Historic Properties. Salem, 1976 with updates.

Tonsfeldt, Ward. "Central Oregon Irrigation Canal." Statewide Inventory of Historic Properties Form, Bend, undated.

\_\_\_\_\_. "North Canal Dam." Statewide Inventory of Historic Properties Form, Bend, 1983.

Vaughan, Thomas (Editor). High and Mighty: Select Sketches About the Deschutes Country. Oregon Historical Society, Portland, 1981.

Water Resources Department, State of Oregon. Deschutes Drainage Basin, Oregon, Land Use Map. Salem, 1978.

Winch, Martin T. "Tumalo--Thirsty Land." Three-part article on the Tumalo Irrigation Project. Oregon Historical Quarterly, Portland, Winter 1984, Spring 1985, Summer 1985.